IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:

Applicants:	:	Frank Check
Serial No.	:	10/730,874
Filing Date	:	December 9, 2003
Title of Invention	:	METHOD OF AND SYSTEM FOR DETECTING AND CORRECTING MODE SWITCHING IN DIFFRACTIVE-BASED LASER SCANNING SYSTEMS
Examiner	:	not yet assigned
Group Art Unit	:	2828
Attorney Docket No.	:	108-028USANA0

Honorable Commissioner of Patents
and Trademarks
Washington, DC 20231

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. 1.97

Sir:

In order to fulfill Applicants' continuing obligation of candor and good faith as set forth in 37 C.F.R. 1.56, Applicants submit herewith an Information Disclosure Statement prepared in accordance with 37 C.F.R Sections 1.97, 1.98 and 1.99.

The disclosures enclosed herewith are as follows:

U.S. PUBLICATIONS

NUMBER	FILING DATE	TITLE
6,154,474	January 4, 1999	LASER DIODE OPTICAL WAVELENGTH CONTROL APPARATUS
6,092,728	July 12, 1999	MINIATURE LASER DIODE FOCUSING MODULE USING MICRO-OPTICS
5,640,407	April 28, 1995	TEMPERATURE REGULATING LASER DIODE ASSEMBLY
5,181,214	November 18, 1991	TEMPERATURE STABLE SOLID-STATE LASER PACKAGE
5,118,964	September 26, 1990	THERMO-ELECTRIC TEMPERATURE CONTROL ARRANGEMENT FOR LASER

		APPARATUS
5,088,098	October 16, 1990	THERMOELECTRIC COOLER CONTROL CIRCUIT
4,792,957	December 22, 1986	LASER TEMPERATURE CONTROLLER
4,737,798	July 3, 1986	LASER DIODE MODE HOPPING SENSING AND CONTROL SYSTEM
4,695,714	February 2, 1984	LIGHT SOURCE STABILIZER WITH INTENSITY AND TEMPERATURE CONTROL
4,631,728	July 22, 1985	THERMOELECTRIC COOLER CONTROL CIRCUIT
4,583,228	November 21, 1983	FREQUENCY STABILIZATION OF LASERS
4,571,728	July 8, 1985	TEMPERATURE CONTROL DEVICE FOR A SEMICONDUCTOR LASER
4,548,463	February 13, 1984	HOLOGRAPHIC SCANNER CONTROL BASED ON MONITORED DIFFRACTION EFFICIENCY
4,485,475	05/27/83	OPTICAL SOURCE PEAK WAVELENGTH CONTROL USING A WAVELENGTH FEEDBACK NETWORK
4,309,671	December 18, 1980	CONTROL APPARATUS
3,628,173	April 28, 1969	LASER MODE SELECTION AND STABILIZATION APPARATUS EMPLOYING A BIREFRINGEMENT ETALON
3,588,738	September 3, 1968	FREQUENCY STABILIZED LASER
3,541,300	July 1, 1968	APPARATUS FOR STABILIZING THE MODDULATION OF COHERENT RADIATION

TECHNICAL PUBLICATIONS

Web-based product brochure for the PLVS-Series Pulsed Violet Laser Sources by TuiOptics, www.tuioptics.com, 2000, pages 1-4.

Product brochure for the LM119/LM219/LM319 High Speed Dual Comparator by National Semiconductor Corporation, August 2000, pages 1-11.

Header file entitled "P12C509.INC Standard Header File 1.02" by Microchip Technology, Inc., pages 1-3.

Product brochure for the Mitsubishi Laser Diodes ML4XX26 Series by Mitsubishi Electric, Inc., February 2000, pages 1-4.

Product manual for the Microchip PIC12C5XX by Microchip Technology Inc., 1999, pages 1-112.

Scientific publication entitled "Non-Contact Dimensional Measurement System Using Holographic Scanning" by Stephen F. Sagan, Robert S. Rosso, David M. Rowe, SPIE, Vol. 3131, pages 224-231.

STATEMENT OF PERTINENCE

U.S. Patent No. 6,154,474 to Yoshida discloses an optical wavelength control apparatus for a laser diode including an optical branching circuit that branches a laser beam from the laser diode into first, second, and third branched laser beams. An optical band-pass filter and optical low- and high-pass filters receive the first, second, and third branched laser beams and transmit laser beams having specific optical wavelengths therethrough as transmitted beams. First, second, and third photodiodes convert output beams from these filters into electrical signals and output them as analog voltages. A comparison amplifier compares the analog voltages output from the second and third photodiodes and outputs a comparison result signal. An operational amplifier performs differential amplification of a reference analog voltage from the first photodiode and the output signal from the comparison amplifier, and outputs a control signal. A temperature adjustment element is in tight contact with the laser diode and generates heat, a temperature of which is externally controlled. A temperature adjustment circuit controls the temperature of heat from the temperature adjustment element on the basis of the control signal.

U.S. Patent No 6,092,728 to Li et al. discloses a miniature laser diode focusing module that emits and focuses a divergent light beam. The focusing module consists of a small-sized light emitter, such as a laser diode, and a micro-optical element seated in a lens holder. The outside diameter of the micro-optical element is 4 mm or less and preferably less than or equal to 2.5 mm. The micro-optical element may be a small conventional lens, a gradient index lens, or one of several types of diffractive optical element. The focal length of the module relative to the light from the emitter is set by sliding the lens holder along its central axis and permanently adhering it in place with respect to the emitter after focusing. During focal adjustment, axial rotation between

the lens holder and between the base of the emitter is prevented by a series of notches. The miniature focusing module is smaller, lighter, costs less and may provide a larger relative aperture than the conventional structures currently used for example in solid state laser scanners.

U.S. Patent No. 5,640,407 to Freyman et al. discloses a laser diode assembly with a laser diode unit which is mounted directly on a compact thermoelectric cooler, which is mounted on a heat sink. A thermally insulating gasket, mounted around the thermoelectric cooler, seals the thermoelectric cooler from the ambient environment, thereby preventing condensation from forming on the cold face of the thermoelectric cooler. A bushing concentrically positions the laser diode unit in the proper optical alignment with respect to the optical assembly, while thermally and electrically insulating the laser diode. A thermally conductive gasket, mounted around the circumference of the laser diode window, returns heat from the heat sink to the window to prevent condensation from forming on the window. The laser diode is the only component cooled by the thermoelectric cooler. Since a portion of the heat transferred by the thermoelectric cooler is utilized to warm the laser diode window, a separate heating element is not required.

U.S. Patent No. 5,181,214 to Berger et al. discloses a laser-diode or laser diode array end-pumped solid-state laser package for optical communications and the like mounted on a common thermally conductive, low thermal expansion base that is temperature stabilized with a thermo-electric cooler. The laser package includes a heat sink, a thermo-electric cooler mounted on the heat sink, a base having a base plate portion mounted on the thermo-electric cooler and a block portion mounted on the base plate portion and optical elements mounted on the base plate and block. The laser active medium and collimating and focusing lenses are mounted with their optical axes collinear in a v-groove formed in a top surface of the block. A laser diode pump is mounted to the base plate and supported so that its laser emission is aligned with the length of the groove. One cavity mirror is a curved reflective coating on an end of the active medium which is transparent to the laser diode pump light and reflective of the active medium generated laser light, while a second cavity mirror is a planar mirror mounted on the base plate. The optical system is aligned at an operating temperature at which the laser diode light's wavelength matches an absorption band of the active medium. A thermistor on the base plate measures the temperature so that a processor can adjust the electric current applied to the thermo-electric cooler to maintain the base plate temperature at the operating temperature even in extreme ambient temperatures.

U.S. Patent No. 5,118,964 to McArdle discloses a thermo-electric laser temperature control apparatus driven by a switching mode control circuit. Driving current polarity determines if the thermo-electric apparatus is operating in a heat absorbent or heat generating mode. A sequencing control circuit is used in association with the control circuit to define operative ranges of the thermo-electric temperature control apparatus consistent with maintaining proper temperature for a linear operative range for the laser. Feedback circuitry permits precision control of the converter output to limit the operative temperature range of the laser to a small precisely defined temperature window.

U.S. Patent No. 5,088,098 to Muller et al. discloses a thermoelectric cooler temperature control circuit that provides a periodic control signal having a substantially constant peak-to-peak magnitude and an average value dependent on a sensed temperature to be regulated. The control signal is coupled to control the heating or cooling of a thermoelectric cooler.

U.S. Patent No. 4,792,957 to Kollanyi discloses a laser temperature controller for controlling the temperature of a laser device. The controller includes a bridge circuit connected to a thermistor device which is mounted on the laser package. The bridge circuit generates error signals representing a need for cooling or heating as the operating temperature of the laser rises or falls about a set threshold. A voltage conversion circuit converts the error signals to a positive or negative polarity voltage. The output of the voltage conversion circuit is applied to a pair of operational amplifiers which input the voltage and compare it to a set reference voltage. When cooling is required a first amplifier provides a biasing voltage to a transistor when a set threshold is exceeded. The associated transistor switches drive current to a thermoelectric device mounted on the laser package thereby, cooling the laser. Similarly, when heating is required a second amplifer and transistor switches current of an opposite polarity to the thermoelectric device, which heats the laser. The output signal from the voltage conversion circuit is also applied to a laser temperature alarm circuit which provides a visual indication and an alarm signal to a controller interface when a set threshold of laser temperature is exceeded.

U.S. Patent No. 4,737,798 to Lonis et al. discloses a printer having holographic scanning disc for scanning the imaging beam from a laser diode. As shown in Figure 3, a pick-off mirror intercepts the zero order (or non-diffracted) beam passing through the facets of the holographic scanning disk, and directs such zero-order beam through a lens to a second mirror, which directs the beam to a beam positioning detector such a linear sensor array. Any shift in the beam that occurs as a result of mode hopping causes the beam to impinge the surface of the beam positioning detector at a different point. The output of the beam positioning detector is coupled to a comparator circuit, which compares the current beam wavelength with a pre-selected desired beam wavelength, and outputs a control signal in response thereto to a temperature control element that controls the temperature of the laser diode.

U.S. Patent No. 4,695,714 to Kimizuka et al. discloses an electrostatic recording apparatus using a laser light source, whose output beam is deflected by a rotating polygon and is focused by focusing lens onto a photosensitive drum. A beam detector detects the laser beam output by the focusing lens and generates a synchronization signal BD, which is supplied to an information processing circuit. The Information circuit and a control circuit cooperate to control the drive current supplied to the laser. In addition, the apparatus includes a heating element attached to the base of the laser and temperature control circuit that operates to measure and selectively heat laser (via control of current supplied to the heating element) to keep the temperature of the laser constant.

U.S. Patent No. 4,631,728 to Simons discloses a circuit for controlling a thermoelectric cooler for a laser diode. The output of a laser diode temperature sensor is amplified and compared to a reference voltage in an integrator. The output of the integrator controls a pulse width modulator that controls a switching transistor that varies the pulse duration of power applied to a filter network. The power output of the filter network is applied to a mode controller that switches the direction that power is applied to the thermoelectric cooler to maintain the temperature of the laser diode at a constant level.

U.S. Patent No. 4,583,228 to Brown et al. describes an apparatus for stabilizing the frequency of a laser source wherein a feedback signal derived from a Fabry-Perot inferometer is coupled to two feedback loops. One loop provides high frequency control of the drive current of

the laser source. The other loop cooperates with a feedback heater to provide low frequency control of the temperature of the laser.

U.S. Patent No. 4,571,728 to Yoshikawa discloses a temperature control device for a semiconductor laser including a temperature sensitive resistor embedded in a base of the laser and a Peltier temperature controlling element that is controlled to heat or cool the laser based upon temperature measured with the temperature sensitive resistor.

U.S. Patent No. 4,548,463 to Cato et al. discloses a multi-faceted holographic disc scanner that utilizes a photodetector to measure power of the zeroth order beam passing through the disc. The output of the photodetector is used to control video amplifier gain or current to the laser source.

U.S. Patent No. 4,485,475 to Large et al. discloses the use of a graded index of refraction lens/grating and multiple detectors to monitor the output peak wavelength of an optical source. As the wavelength of the source varies, different detectors are activated. The output of these detectors is used to control a thermoelectric cooler to raise/lower the temperature of the source so as to drive the output wavelength to the desired peak output wavelength.

U.S. Patent No. 4,309,671 to Malyon discloses an apparatus to control the wavelength of a semi-conductor laser. The emission of the laser is sampled by a first beam splitter and photodiode and by a second beam splitter, filter, and photodiode. The outputs of the two photodiodes are fed via amplifiers to the positive and negative terminals of a subtraction amplifier, whose output is fed as negative feedback to an amplifier for controlling temperature of the laser (by heating or cooling a heat sink mounted to the laser).

U.S. Patent No. 3,628,173 to Danielmeyer discloses a frequency stabilized laser source utilizing a laser element and birefringent plate (which is disposed in a temperature controlled oven). The active laser element is excited, and a portion of the laser output beam is diverted by a beam splitter to an optical detector, which generate an electrical signal that represent the amplitudes of such beam. The amplitude signal is compared to a reference by a compator, which produces an error signal which drives optical resonating mirrors 10 and 12 to reduce the error signal, thereby stabilizing the amplitude and frequency of the output beam.

U.S. Patent No. 3,588,738 to Goodwin discloses a frequency stabilized laser wherein an active laser element and birefringent plate are disposed in a regenerative cavity. The active laser element is excited, and a portion of the laser output beam is diverted by a beam splitter to a prism where it is separated into two beams. The beams are directed to optical detectors, which generate electrical signals that represent the amplitudes of such beams. The amplitude signals are compared by a compator, which produces an error signal which drives a frequency adjustment element (e.g., piezoelectric device attached to a mirror in the optical train) coupled to the laser.

U.S. Patent 3,541,300 to Stadnik discloses a system and method for regulating the operating temperature of a coherent radiation source by sensing the temperature of a holder (that holds the source) and controlling the supply of heat to the holder in response thereto.

The web-based product brochure for the PVLS-Series Pulsed Violet Laser Sources by

TuiOptics, Inc. describes a commercially available pulsed violet laser source that includes a TEC cooler mounted on the laser module which is combined with a measurement thermistor to provide temperature control of the laser diode and its collimator.

The product brochure for the LM119/LM219/LM319 High Speed Dual Comparator by National Semiconductor describes the pins, functions, and operational characteristics of a line of commercially-available integrated circuits.

The header file labeled "P12C509.INC Standard Header File, Version 1.02" by Microchip Technology, Inc. sets forth a standard header file labeled that defines configurations, registers and other useful information for programming the PIC12C509 microcontroller with commercially-available programming tools.

The product brochure for the ML4XX26 Series Laser Diodes by Mitsubishi Electric describes the pins, functions, and operational characteristics of a commercially-available visible laser diode.

The product manual for the PIC12C5XX 8-Pin, 8-Bit CMOS Microcontrollers by Microchip Technology, Inc. describes the pins, functionality, instruction set, and operational characteristics of a commercially-available microcontroller.

The scientific publication entitled "Non-Contact Dimensional Measurement System Using Holographic Scanning" by Sagan et al. describes a holographic scanning system that utilizes a laser diode as a scanning light source. The laser diode is mounted in a metal block that is thermally isolated from the instrument frame. A thermoelectric cooler (TEC) and temperature controller are used to maintain the operating temperature of the laser diode over a narrow range of approximately 0.5 degrees C.

A separate listing of the above references on PTO Form 1449 and a copy of these references are enclosed herewith for the convenience of the Examiner.

Applicants believe that no fees are due at this time. However, if the Examiner deems it necessary, he may charge any requisite fees to Deposit Account No. 16-1340.

Respectfully submitted,

Dated: February 8, 2005

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Thomas J Perkowski, Esq.
Date: February 8, 2005

Substitute for form 1449A/PTO

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SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT

Sheet	1	of	3

Complete If Known	
Application Number	10/730,874
Filing Date	December 9, 2003
First Name Inventor	Frank Check
Group Art Unit	2828
Examiner Name	not assigned
Attorney Docket Number	108-028USANA0

U.S. PATENT DOCUMENTS

Examiner Initials	Cite No.	U.S. Patent Documents		Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Intn'l Class / Sub Class
		Number	Kind Code (if known)			
		6,154,474		Yoshida	11/28/2000	H01S 5/0687
		6,092,728		Li et al.	07/25/2000	G06K 7/10
		5,640,407		Freyman et al.	06/17/1997	H01S 3/04
		5,181,214		Berger et al.	01/19/1993	H01S 3/04
		5,118,964		McArdle	06/02/1992	H01H 37/10
		5,088,098		Muller	02/11/1992	H01S 3/043
		4,792,957		Kollanyi	12/20/1988	H01S 3/04
		4,737,798		Lonis	04/12/1988	G01D 9/42
		4,695,714		Kimizuka et al.	09/22/1987	G01U 1/32
		4,631,728		Simon	12/23/1986	H01S 3/00
		4,583,228		Brown, et al.	04/15/1986	H01S 3/10

U.S. PATENT DOCUMENTS						
Examiner Initials	Cite No.	U.S. Patent Documents		Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Intn'l Class / Sub Class
		Number	Kind Code (if known)			
		4,571,728		Yoshikawa	02/18/1986	H01S 3/04
		4,548,463		Cato et al.	10/22/1985	G02B 5/32
		4,485,475		Large et al.	11/27/1984	H01S 3/10
		4,309,671		Malyon	01/05/1982	H01S 3/13
		3,628,173		Danielmeyer	12/14/1971	H01s 3/10
		3,588,738		Goodwin	06/28/1971	H01s3/02
		3,541,300		Staduik et al	11/17/1970	A01s 3/02

PUBLICATIONS		
Examiner Initials	Cite No.	Description
		Web-based product brochure for the PLVS-Series Pulsed Violet Laser Sources by TuiOptics, www.tuioptics.com, 2000, pages 1-4.
		Product brochure for the LM119/LM219/LM319 High Speed Dual Comparator by National Semiconductor Corporation, August 2000, pages 1-11.
		Header file entitled "P12C509.INC Standard Header File 1.02" by Microchip Technology, Inc., pages 1-3.
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		Product manual for the Microchip PIC12C5XX by Microchip Technology Inc., 1999, pages 1-112.
		Scientific publication entitled "Non-Contact Dimensional Measurement System Using Holographic Scanning" by Stephen F. Sagan, Robert S. Rosso, David M. Rowe, SPIE, Vol. 3131, pages 224-231.

EXAMINER **DATE CONSIDERED**

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance not considered. Include copy of this form with next communication to applicant.

(INFORMATION DISCLOSURE STATEMENT – SECTION 9 PTO-1449)